На основе всего вышеизложенного хорошо прослеживается, что формирование сети это не только образование, строящееся снизу, возникающее вследствие деятельности самостоятельных юридических лиц, а также успешное направление сокращения огромных необозримых стурктур.

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LIFE CYCLE ASSESSMENT, LIFE CYCLE THINKING– HUNGARIAN CASE STUDY

LCA and life cycle thinking are used in a variety of applications to help decision. Both of them enable identification and quantification of environmental impacts of a product, process or human activity. This study gives a summary about Hungarian LCA practice and shows trends of further development, and some practical applications from environmental impact of the municipal waste treatment to evaluate regional sustainability.

Оценка жизненного цикла и размышление о жизненном цикле как средстве, которые способсвуют принятию правильного решения. Они оба позволяют идентификацию и определение количества воздействий на окружающую среду продукта, процесса или деятельности человека. Статья описывает исследование венгерской практики LCA и показывает тенденции дальнейшего развития, и описывает некоторые практические примеры от оценки воздействия утилизации коммунальных отходов.

Introduction. Life cycle assessment (LCA) is a tool that can be used to evaluate the environmental load of a product, process, or activity throughout its life cycle. Today's LCA users are a mixture of individuals with skills in different disciplines who want to evaluate their products, processes, or activities in a life cycle context. Due to the recent development of LCA methodologies and dissemination programs by international and local bodies, use of LCA is rapidly increasing in the different sectors for both of agricultural and industrial products. Although LCA methodologies have been improved, further international standardization would broaden its practical

applications, but parallel's with this the requirement also is increasing simplifying of it, especially if we think about multistakeholder decision. In more case the life cycle thinking is a method to reach this need. Life Cycle Thinking is a key element in a growing number of policies, building on e.g. the Integrated Product Policy Communication (*COM(2003)302*) , as well as the two Thematic Strategies on the Sustainable Use of Natural Resources (COM(2005)670), and on the Prevention and Recycling of Waste (COM(2005)666). Life Cycle Thinking (LCT) is the process of taking into account in decision making all resources consumed and all environmental and health pressures that are associated with the life cycle of a product, considering the extraction of resources, production, use, re-use, transport, recycling, and ultimate waste disposal. This process helps to avoid the "shifting of burdens" among life cycle stages, countries, and the various environmental and human health impacts such as climate change, summer smog, acid rain, carcinogenic effects, land use, etc., as well as global material and energy resource depletion. The UNEP/SETAC Life Cycle Initiative is also aiming at facilitating the use of life cycle approaches worldwide by encouraging life cycle thinking in decision-making in governments, the launch of the International Panel for Sustainable Resource Management (November 2007 in Budapest, Hungary) comes in timely fashion providing a platform for future interlinkages with governmental decision-makers. The overall objective of the International Panel for Sustainable Resource Management (Resource Panel)[15] is to provide independent scientific assessment on the environmental impacts from the use of resources (both renewable and non-renewable) over the full life cycle, taking into account economic development and supply security issues.

According to the targets set for sustainability, integrating the principles of sustainable development into country policies and programs is one of the main goals for development projects or scientific analyses in multi-stakeholder contexts have to be more transparent, participatory, and stakeholder-based in order to provide useful information to assist responsible decision making [7]. The role of life cycle thinking is increasing in field of emerging technology too. The obvious benefits and potentials are currently neither substantiated by an assessment of ecological and human health risks nor by a holistic assessment of all aspects along the life cycle of nano based products and services. Little work has been done, so far, to compare, e.g., the efforts

[15] http://www.unep.fr/pc/sustain/initiatives/resourcepanel/index.htm

of material production and recycling with the benefits in the use phase beyond economic considerations [2].

LCA activities in Hungary. Life Cycle Assessment is a holistic assessment of the environmental performance of products and services. It measures how much impact a product has both directly and indirectly. It covers all phases of the product's life cycle and it covers all significant environmental impacts. This method is known in Hungary since 1991, but it is not applied in large field. It is a good tool to analyze the quantity of direct/indirect impact of a product. It covers all phases of the product's life cycle and it covers all significant environmental impacts

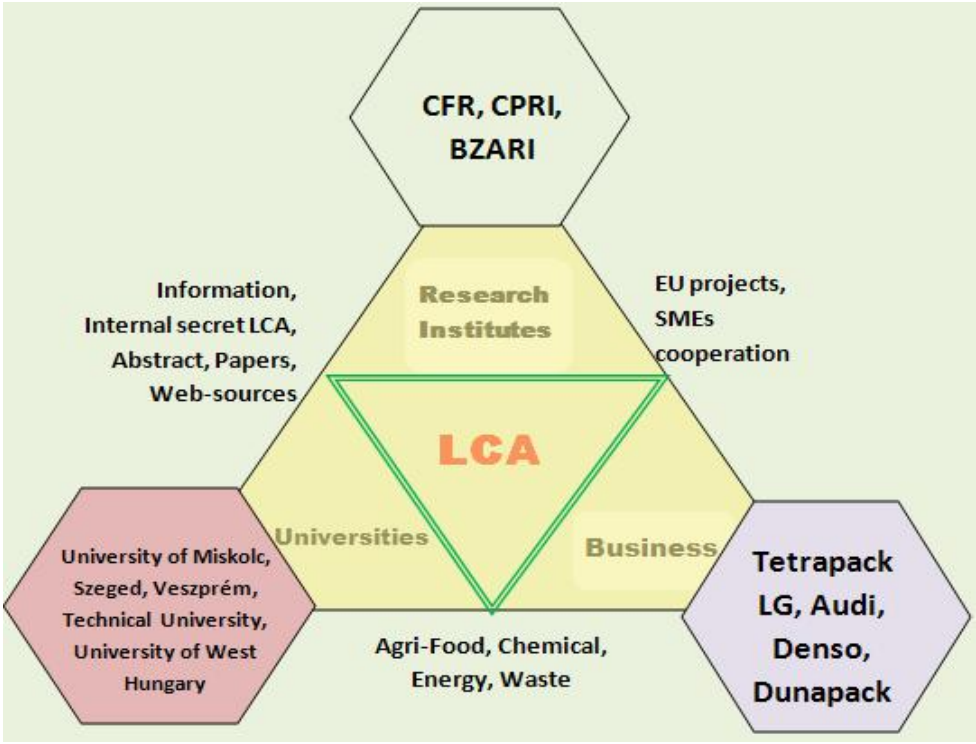

Figure 1: State of the art [5].

The LCA studies were mainly made based on LCA thinking or those were simplified LCAs, especially for environmental friendly products, eco-labels. Besides, this we could find detailed LCAs, made using SimaPro or Gabi software. The most of LCA studies were published in Hungarian language, except the international conference proceedings or paper. Life cycle thinking is a subject in many EU-directives.

The object of LCA studies was very different and those applied different approaches:

• Food products (milk, bread, meat product, ground paprika), nutrition Shopping-cooking-eating, as a part of SusHouse project – partly as LCA thinking or simplified LCA but there was detailed LCA too for ground paprika – in student diploma works (Szeged College of Food Industry, Veszprém University)

• Packaging materials: Tetrapak – PhD research – Veszprém; PS vs. Bio-degradable boxes on base of bio-mass, CFRI and Szeged CPRC; PE vs. Bio-degradable polymer on base of bio-mass, PET vs. Glass bottle, CFRI and Szeged CPRC; Egg box – Km projekt Ltd.

• Bio-fuel - Veszprém, Követ, Technical University

• Energy system, energy sources, bio-fuel – Bay Applied Research Institute, Miskolc University, KM projekt Ltd.

• Small part of Car, portion out pump – Denso-Követ,

• Furniture – COWI (Bay Applied RI, Szeged CPRC, Miskolc University)

• Electrical, electronic goods (Refrigerator/fridge)- COWI (Bay Applieid RI, Szeged CPRC, Miskolc University)

• Building – Technical University

• Services – Technical University

Application of LCAs

o LCA thinking (bread, household): LCA methods adaptation (SimaPro); Methodological aspects for Hungary; LCA application for biodegradable packaging; LCA and eco-labeling; eco-design;

o Bigger domestic projects: Building of n-line LCA database; Baross project. Building on-line database.

"Development of a national LCA database for supporting the environmentally sound development of the Hungarian enterprises". It is supported by GVOP-3.1.1.-2004-05-0248/3.0. (Economical Competitiveness Operative Programme). The project main goals were: a) to establish a Hungarian LCA database that is compatible with the most used international LCA software, paying respect to domestic specialties in the area of energy- and waste management: to develop a dataset which presents the environmental effects of 1 MJ energy production in Hungary; to develop the model of the processes of Hungarian waste management; б) to help the SMEs to design from the aspect of environment, easier availability of objective environmental assessment.

It was partly methodological research (data collection, system modelling, and assessment process and web development. Data inventory in this project is based on the results reached in the international research with consideration of Hungarian conditions.

The database, which is the issue of our research can support SMEs the in eco-design based development, the objective environmentally assessment and it help to apply the principles of sustainable development and to develop environment-friendly products and technologies.

By these means their position on the market and competitiveness can improve according to the increasing market expectations. Among the development of domestic data and coefficients it can be utilized in the education and in research. The on-line database makes using the LCA in wide-ranging possible.

During the project we elaborated the environmental impact of Hungarian electricity mix by primer resource, and we showed the impact of 1 MJ produced electricity. The second big field was the investigation the environmental assessment of waste treatment. The next figure shows the case of GWG potential of Hungarian electricity mix. The *Baross Gábor project* is focusing to problem of the waste of electric and electronic equipments. Selective treatment is essential, as they partly consist of valuable and partly hazardous components. The goal of the project is the determination of the environmentally, technologically and economically most feasible procedure for the treatment of e-scrap within the local circumstances through the application of experimental and environmental management instruments (life cycle assessment, life cycle cost analysis, sustainability index).

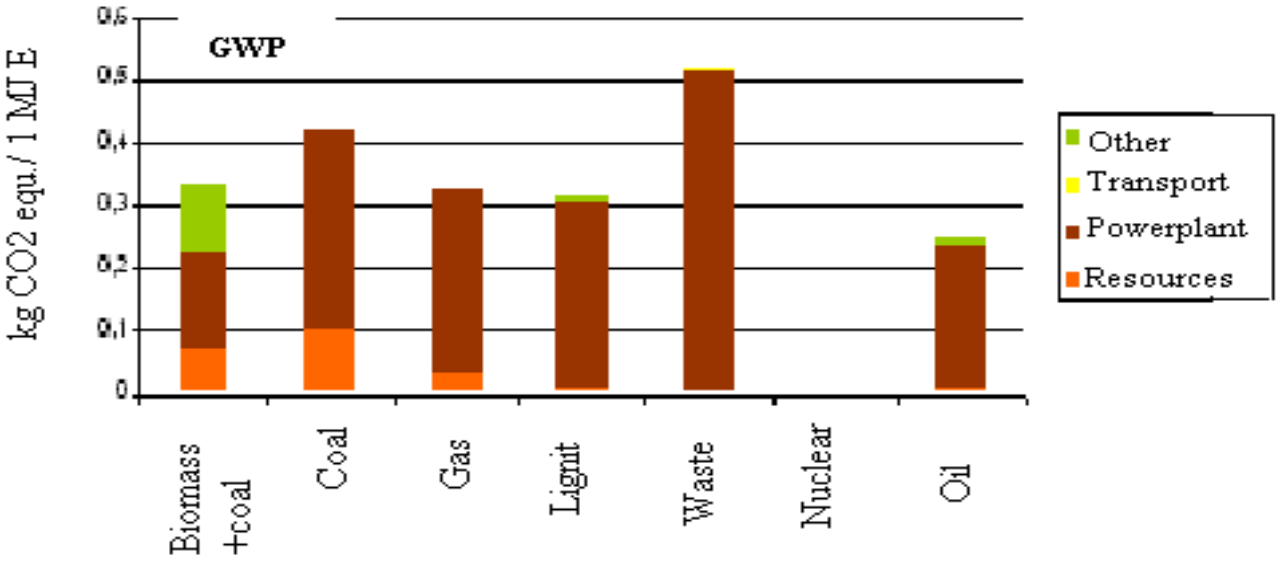

Figure 2: Case of GWG potential of Hungarian Energy mix by primer energy sources [6]

Within the project such methods are going to be worked out that have not yet been applied in Hungary and have future feasibility.

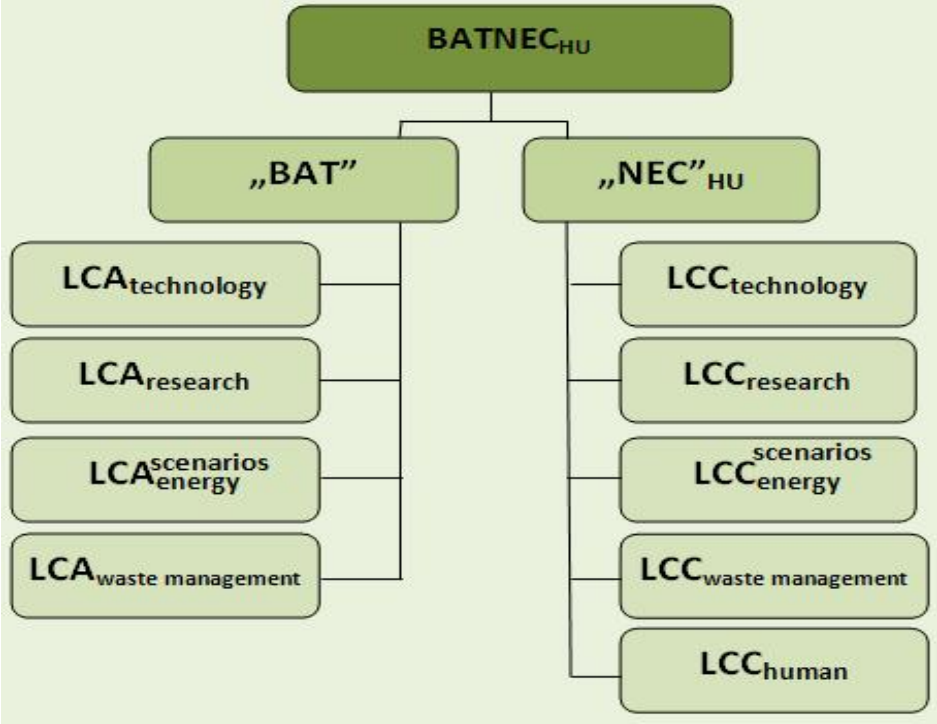

Figure3: LCA int he Baross project [3].

The members of the consortium have all the professional abilities that the successful implementation of the project requires. **(***Baross Gabor Innovation Programme 2005 -- Encouragement of Economical Integration)*Life cycle thinking originates from the directive on Integrated Product Policy (IPP). A variety of tools are available to assess the impact of different life-cycle impacts when using life-cycle thinking. These include life-cycle assessment, management and costing as well as design for the environment (DfE). The latter is particularly applicable to life-cycle thinking for small and medium-sized enterprises (SMEs) as it reduces the effort for decision support to product developers. During our researches we tried to use life cycle analysis besides usual product or production process analysis for regional sustainable development analysis as well. The thought to adopt the method to measure the environmental effects of producing one unit of GDP and to compare the regional differences in their values came during the life cycle analysis of the environmental burden of the Hungarian energy mix. The analysis made with SimaPro software. The adoption of LCA to regional level required (as a standardized use of LCA) to:

- Set the borderlines of the system,
- Determine the functional units,
- Determine the requirements regarding the quality of the data,
- Collection of data and finally
- Finishing the effect analysis.

In our case the borderline of the system is the official border of the region, the functional unit is 1 GDP. Theoretically, the starting point is the value of GDP produced in a year, followed by setting the inputs with the help of the input-output matrix, and collecting output side emissions from environmental statistics. Uncertainties met during the research:

o There is no reliable statistical data on material- and energy flows. Data on energy flows' structure is not perfect, but would be essential from sustainability's point of view. As far as we know a material flow accounting process is being worked out (Kohlhéb et al., 2006), but we have not met time series like this up to now.

o Official borderlines (in case of regions) and environmental agencies territories are different from each other, so emission information are uncertain as well.

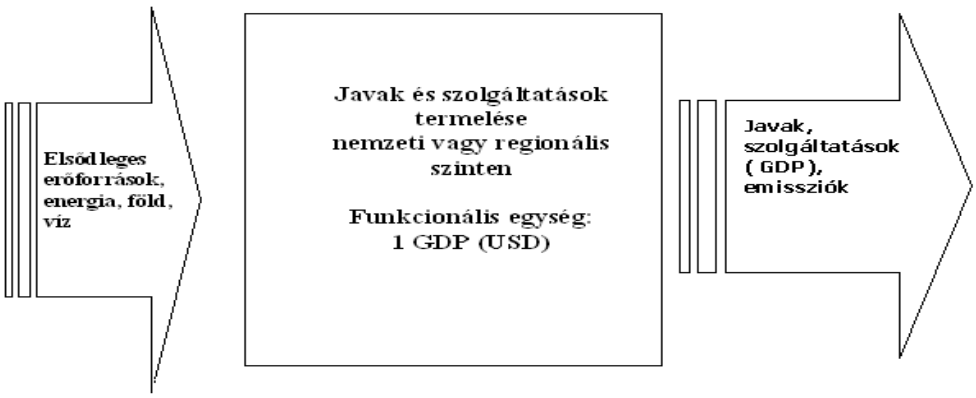

Figure 4 – modelling LCA for regional or national levels (own work)

The lack of proper data made us build our analysis on industrial branches information and we have not calculated with material flows, used only energy, field, water and fertilizer as inputs, we have not considered the transportation of imported materials.

After the collection of data we made an inventory:

o Based on the national or regional material and energy flows (depending on the type of analysis) data were set in a detailed input-output table with the use of natural units;

o On the input side the quantities of materials, energy and other resources were set (field, water, energy);

o While on the output side the value of goods and services taken to the market in Ft (the produced GDP), and all of the emissions (gas, both fluid and solid) were set in kilograms

About the future. Those researchers who are interested in LCA are working together on a LCA project in Miskolc. They give the seed of domestic LCA activities

(www.lcacenter.hu), they organised more LCA conferences, and they organised the HUPLEE LCA seminar too[16].

There is a well bounded development of the LCA application. The LCA role is increasing in the Governance Policy; it appears in more topics:

− Hungarian Environmental Program 2003-2008,

− Hungarian Sustainability Strategy,

− WEEE: The Directive on Waste of Electronic and Electric Equipment.

ROHS: The Directive on Restriction of Hazardous substances (in Electronic and Electric Equipment), EEE: The Directive on Environmental Conformity of Electronic and Electric Equipment, IPP:A proposal on Integrated Product Policy (which will also refer to electronic products): voluntary instruments focusing on ETAP, LCA and EMAS; legislation implementation of harmonization directives and extended producer responsibility (EPR); Work on improving cooperation with the ministry of economics. (Sources: Minutes of the IPP Regular Meeting 23 November). The knowledge and use of western-based environmental management tools like LCA (life cycle assessment) in Eastern Europe is very low, it is also in Hungary. The main task is the wide range expansion of practical application of the method at the industrial enterprises www.lcacenter.hu

The programme of the Association

- To encourage the life-cycle thinking and to disseminate the application of the LCA methodology
- Professional – scientific activities regarding to LCA
- To public foreigner and domestic case studies and project results
- The initiative of common competition and taking part in it's elaboration, coming forward with new suggestions
- To develop Hungarian datasets and to actualize the existing databases/processes
- Government programmes and the LCA
- Strategy of sustainable development: the first SD Action Plan will be published in early 2008
- National Environmental Programme 2003-2008
- World Science Forum 2007 Nov. - LCA!!
- NDP II. 2007-2013: EEOP (inplicite)
- Environmental knowledge chain 2008
- SCP-SÍP

[16] The HUPLEE LCA seminar was supported by Apponyi Albert mecenatura project on Number 2006ALAP3-2006913/06.

LCA in the government programme: New possibilities for the cooperation and grant; As an element of Sustainable Development Strategy or; As an element of environmental knowledge chain; Cooperation between Domestic Universities and LCA practioners; Cooperation at international level. We are optimist although the integrated product policy (IPP), the life-cycle-assessment (LCA) based planning and price-setting has not made an appearance in economic policy.

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НОВЫЙ ПОДХОД К ОСНОВАННОМУ НА ЦЕННОСТИ ОРГАНИЗАЦИОННОМУ РАЗВИТИЮ

Термин организационного развития прошел значительные изменения, поскольку ожидания относительно изменений компаний увеличились во многих аспектах. Акцент перешел на выполнение программ – для того, чтобы поддержать, достигнуть стратегические цели – которые могут гарантировать достичь самую большую добавленную стоимость.Успешные изменения воплощены организационных способностей, прибывают из координирования процессов, структур, человеческих ресурсов этих систем и руководящих методов соответствующим и уникальным способом. Рассматривая это, новый подход оценить организационное развитие, основанное на развитии и улучшении организационных целей способностей, для того чтобы проектировать и проверять эффективную организационную систему управления.

The term of organizational development has gone through considerable changes as the expectations concerning company changes have increased in many aspects. The emphasis has shifted towards / on implementation of programmer – to support to reach strategic goals – which can ensure / guarantee the biggest added value. Successful changes are embodied of organizational capabilities which come from coordinating processes, structures, human resources, IT-systems and managing practices in an appropriate and unique way. Considering all this, the new approach to value – based organizational development based on developing and improving organizational capabilities targets to design and verify an efficient organizational control system.